



Understanding and optimization of a low energy X-ray generator for intra-operative radiation therapy



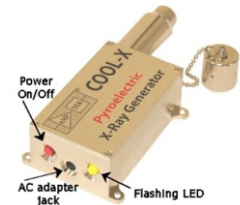
Master thesis / Master IDP / HiWi position

General project overview

The research activity is focused on the combination of minimal-invasive therapy techniques with diagnostic imaging and navigation modalities, e.g. application of intra-operative radiation therapy, MRI guided high focused ultrasound or intra-operative SPECT with MRI guidance.

An initial development goal is to use advanced MRI imaging to find and localize small pathologies and subsequently perform minimal-invasive therapy with a small and lightweight X-ray generator and continuous intra-operative imaging for visualization and navigation.

To achieve the development of a usable system and procedure, a translational approach and close and intensive interdisciplinary collaboration is required between the clinical specialists (Surgical Oncology, Radiation Therapy, Radiology) and the technical faculties of Physics, Information Science and Medical Engineering.

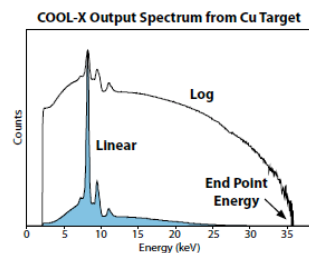


Topic

The student will study and understand the dose distribution and biological effectiveness of the pyroelectric X-ray generator available, both in theory and experiments. He or she will tackle the following problems and questions with the aim of using this device for radiation therapy, ultimately inside the operating room:

- Shape of the X-ray beam and how it can be manipulated
- Amount of radiation produced
- Required doses for the different radiation treatments of tumors
- Calculate time of radiation treatment needed
- Effects of the produced radiation on the tissue (breast, liver, kidney, ...)
- Evaluation of different technologies on basis of MINIATURIZING possibilities (X-ray generation, dose distribution, estimated cost)

An in-vitro setup will be created to apply the low-energy X-rays to real cancer cells and study their biological effectiveness.



The student working on this project will have the possibility of working in a lab and clinical environment as well as gaining experience in project management with several industrial partners.

Requirements

Interest in X-rays and their medical applications and knowledge of "Biomedical physics I + II" lectures by Prof. Franz Pfeiffer and Prof. Jan Wilkens or equivalent.

Supervision / Contact

This project is proposed and supervised by Prof. Dr. Michael Friebe (I16, CAMP, TUM) and Philipp Matthies. Working environment will be provided at IFL, Klinikum rechts der Isar, TUM, and TUM IAS, Campus Garching.

For more information and literature please visit <http://campar.in.tum.de/Students/MaLowEnergyXray> or contact

- Dr. Michael Friebe (friebe@in.tum.de) or
- Philipp Matthies (matthies@in.tum.de)